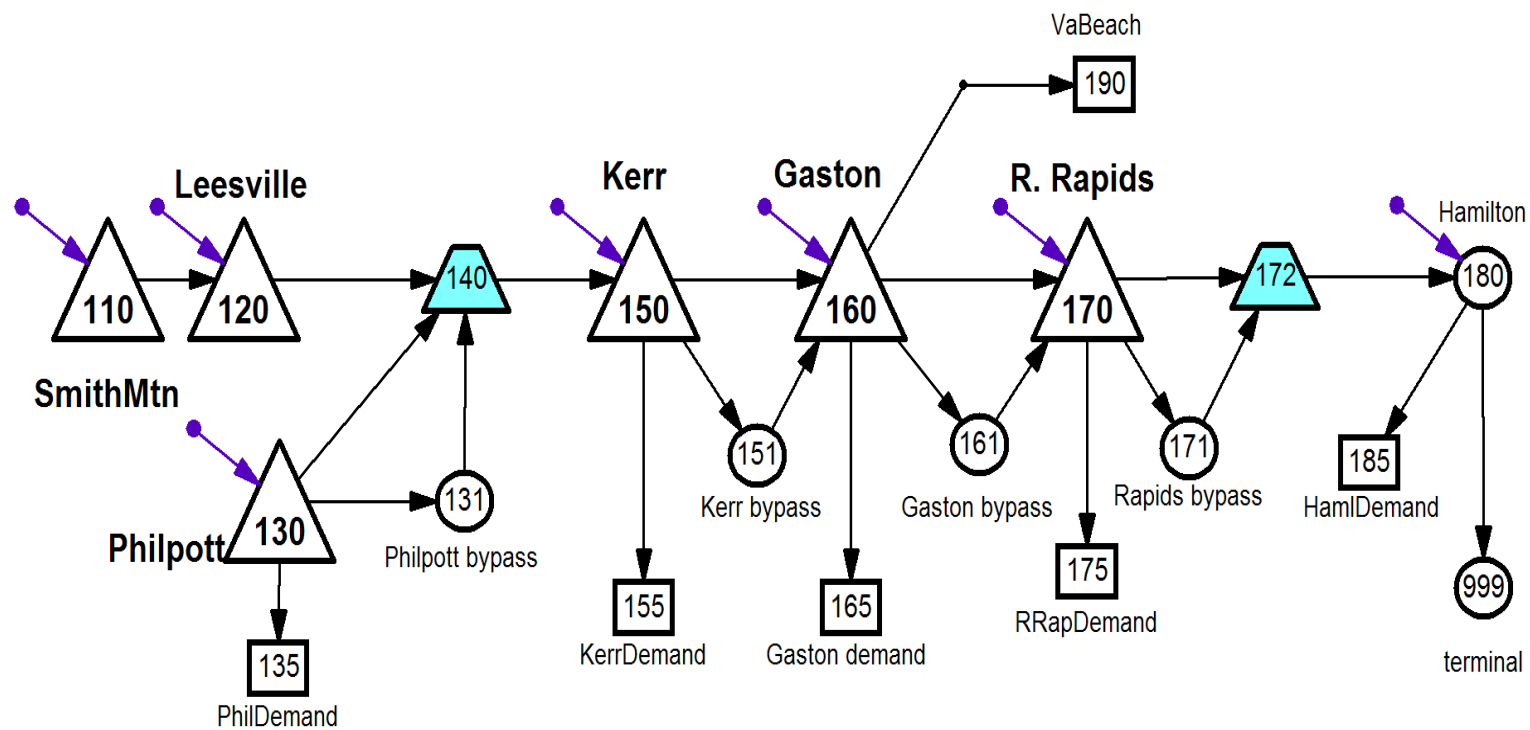


RRBROM

- **Mass balance flow model**
 - **Daily time step**
 - **Designed to evaluate alternative operating policies over the period of record**
- **Output**
 - **Time series of flows and elevations at all nodes**



Purpose of Regressions

- Use only releases from Roanoke Rapids Dam to compute stages
- Compute stages in the river at twelve locations downstream:

Cashie Conine Halifax
Hamilton Hills Ferry
Jamesville
Oak City Plymouth Scotland
Neck
Westover Williamston
Woodard

Summary of Regressions - 1

- Period of record is June 1999 – December 2000.
- Statistics on streamflows are often done with log transforms to make the distribution closer to normal.
- We determined that $Q^{0.15}$ gave a slightly better R^2 than $\log_{10}(Q)$, and the peak flows fit better
- Trying to account for a “storage” term, using rainfall and tide data proved unfruitful.

Summary of Regressions - 2

Form of equation:

Stage = constant

+ c1*ma0L1 + c2*ma24L1 + c3*ma48L1 +
c4*ma96L1

+ c5*ma0L2 + c6*ma24L2 + c7*ma48L2 +
c8*ma96L2

+ c9*ma0L3 + c10*ma24L3 + c11*ma48L3 +
c12*ma96L3

+ c13*Lag-0 + ... + c61*Lag-48

Where:

ma0L1 = 24 hr mov. avg. flow to the 0.15 power, not

ma24L2 = 24 hr mov. avg. flow to the 0.3 power, lagged

Lag-0 = one-hour flow to the 0.15 power, not lagged

Lag-1 = one-hour flow to the 0.15 power, lagged 1 hour

Summary of Regressions - 3

Selection of regression model is based on:

- R-squared
 - All 61 terms were used to start the regressions
 - Terms were deleted based on the P values, the probability that the coefficient is 0, without allowing the R-squared to drop more than 0.002
- Followed the “principle of parsimony”

Example of Regression Result

Hamilton R-Sq = 95.9%

Stage = 433

- 93.5	MA0L1	- 149	MA24L1	- 60.8	MA48L1
- 57.8	MA96L1	+ 24.9	MA0L2	+ 42.0	MA24L2
+ 17.3	MA48L2	+ 15.0	MA96L2	- 2.09	MA0L3
- 3.77	MA24L3	- 1.55	MA48L3	- 1.24	MA96L3
+ 0.287	Lag-0	- 0.333	Lag-1	- 0.374	Lag-3
- 0.224	Lag-5	- 0.201	Lag-6	- 0.316	Lag-8
- 0.198	Lag-10	- 0.353	Lag-12	+ 0.101	Lag-26
+ 0.081	Lag-29	- 0.238	Lag-42	- 0.248	Lag-47

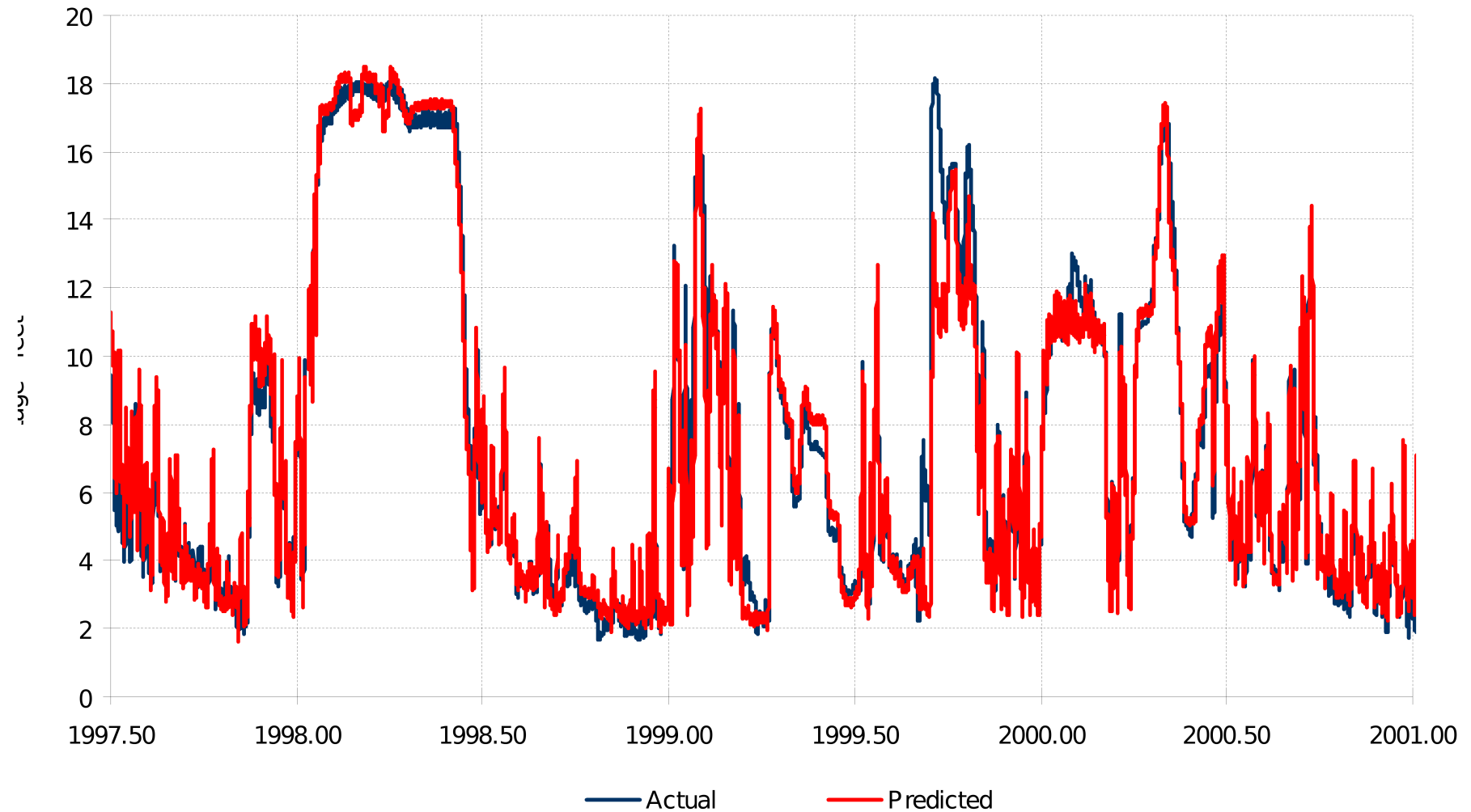
Residual Analysis

Computed the frequency of residuals being at or above a given threshold for a given number of consecutive hours

Analysis of Residuals

				Number of Violations				
Regression	Thres- hold in Feet	Residual Threshold in Feet	Points	Hourly	3- Hourly	12- Hourly	24- Hourly	48- Hourly
Hamilton	0	0.25	30,790	22,434	19,838	15,050	11,904	8,832
R-sq = 0.959	0	0.50	30,790	14,019	11,662	8,165	6,160	4,636
	0	1.00	30,790	4,807	4,104	2,857	2,199	1,720
	11	0.25	6,998	5,981	5,475	4,389	3,626	2,714
	11	0.50	6,998	3,989	3,161	2,272	1,871	1,521
	11	1.00	6,998	1,664	1,535	1,283	1,109	914
				Fraction of Violations				
	0	0.25	30,790	0.729	0.644	0.489	0.387	0.287
	0	0.50	30,790	0.455	0.379	0.265	0.200	0.151
	0	1.00	30,790	0.156	0.133	0.093	0.071	0.056
	11	0.25	6,998	0.855	0.782	0.627	0.518	0.388
	11	0.50	6,998	0.570	0.452	0.325	0.267	0.217
	11	1.00	6,998	0.238	0.219	0.183	0.158	0.131

Hamilton River Stages from Q, Hourly



Hamilton River Stages from Q, Hourly

